Automatically Adjust The Smart Phone

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Abstract

Mobile application development is a hot topic that has great appeal to computer science students. Context-aware computing is a mobile computing paradigm in which applications can discover and take advantage of contextual information, such as user location, time of the day, nearby people and devices, and user activity. Many researchers have studied and built several context-aware applications to demonstrate the usefulness of this new technology.

This project will study context-awareness in depth, have the application support collecting and disseminating context and adapt to the changing context. Specifically, the application aims to automatically adjust the status of a mobile phone based on the user's location, time of the day, and network environment. It has been observed that people want to have more control over when they receive cell phone calls, depending on their current context. For example, they prefer not to take unexpected calls during a meeting with their boss. This project identifies three different environments: at work, at home and on the go. When at work, the phone is set to be in silent or vibration mode for meetings based on the calendar. The application also gives suggestions for restaurants near the office during lunchtime. When at home, the application will list information about movies for the next a few hours in cinemas nearby. When on the go, the application will give directions from the phone's current location to points of interest, distance to destinations, and estimated times of travel.

The application is written as a service running in the background. The user can use his/her cell phone as usual without the need to close the application. The application, on the other end, will automatically adjust the smart phone's status based on the phone's context information, such as ring tone, background, nearby information, and brightness. The application explores various sensors APIs. The mobile technology chosen for this application is Android.

1 Introduction

Mobile application development is a hot topic that has great appeal to computer science students. Context-aware computing is a mobile computing paradigm in which applications can discover and take advantage of contextual information, such as user location, time of the day, nearby people and devices, and user activity. Many researchers have studied and built several context-aware applications to demonstrate the usefulness of this new technology.

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2 Running the Application as a Service

There are two major platforms in the mobile device community: iOS and Android. This project chose Android development mainly for the reason of its openness. In addition, all the tools in the Android development are free and no special hardware is required.

Application components are the essential building blocks of an Android application. There are four different types of application components: Activity, Service, Content Provider, and Broadcast Receiver. Each type serves a distinct purpose and has a distinct lifecycle that defines how the component is created and destroyed [2]. This project intends to develop a mobile application, running as a service in the background. A *service* is a component that runs in the background to perform long-

running operations or to perform work for remote processes. A service does not provide a user interface. Example: a service might play music in the background, while the user is in a different application. An activity can start the service and let it run or bind to it in order to interact with it.

This project is developed as a service running in the background. There is only one user in this application, the smart phone's user/owner. The user will use his/her phone as usual. The application will automatically adjust the status of the phone based on the user's current location, the time of the day, etc.

This project identifies three different environments based on the user's location: at work, at home and on the go. The location information is obtained through the phone's built-in GPS. Once the user installs the application, he/she needs to register to set up an account for security reasons. Meanwhile, the user will provide his/her email accounts at work and at home. After setting up an account, when the user starts the application for the first time, the user needs to identify his/her office and home locations on the map, as shown in Figure 1.

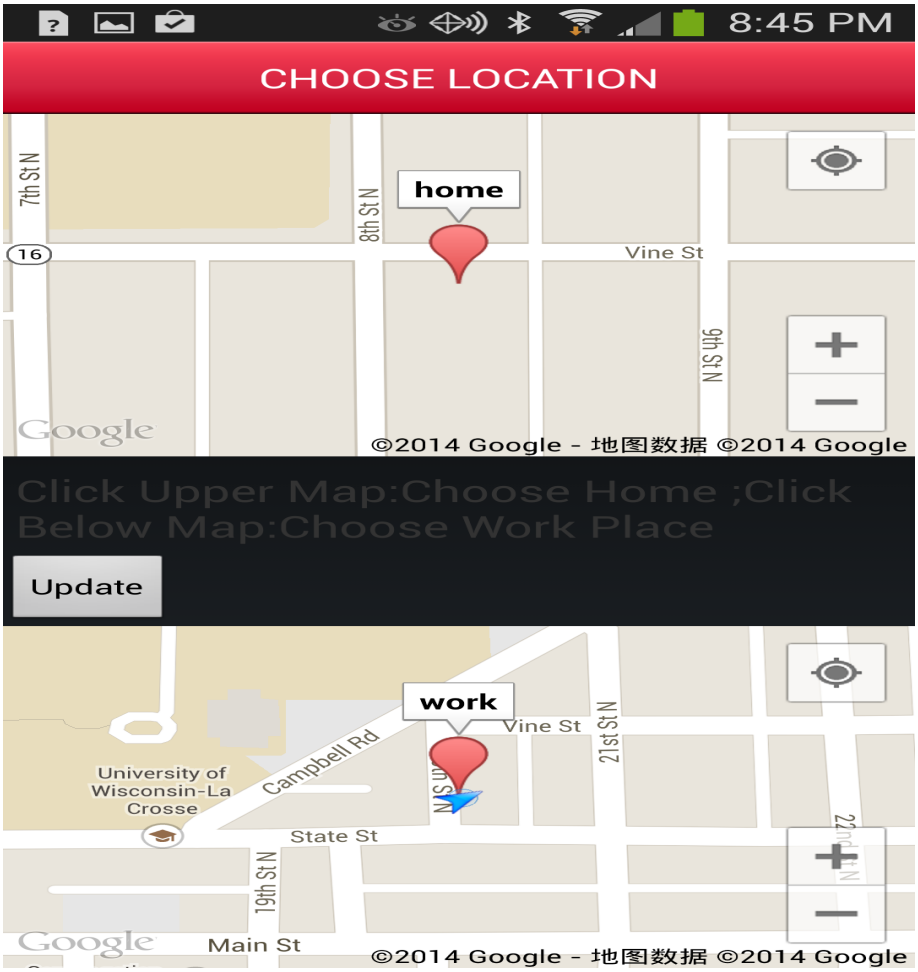

Figure 1 Choose Home and Work Locations on the Map

3 At Work

When the application running in the background recognizes the user's current location is at work, it will change the wallpaper to be office background, set the ringtone's volume to medium, and convert the email account setting to the office account. If there is an incoming call, the application will first check the user's calendar. If the user is currently having a meeting, the incoming call will be cut off, instead, a text message will be sent from the user's smart phone to the caller: " I am in a meeting".

Below is the code segment that is written to end the incoming call and send a text message, if the user is in a meeting at work.

```
PhoneStateListener phoneListener = new PhoneStateListener(){
                @Override
                public void onCallStateChanged(int state,String incoming){
                        if( state == TelephonyManager.CALL_STATE_RINGING){
                                try {
                                        iTelephony.endCall();
                                } catch (RemoteException e) {
                                        // TODO Auto-generated catch block
                                        e.printStackTrace();
                                }
                                incomingNumber = incoming;
                                sendSMS();
                                }
                        }
        };

        telephonyManager= (TelephonyManager)getSystemService(TELEPHONY_SERVICE);
        telephonyManager.listen(phoneListener, PhoneStateListener.LISTEN_CALL_STATE);
        smsManager = SmsManager.getDefault();
```

When it is the time for lunch, the application will list all the restaurants near the office with the phone number, as shown in Figure 2.

Figure 2 List of the Restaurants Near the Office

4 At Home

When the application running in the background recognizes the user's current location is at home, it will change the wallpaper to be a home background, set the ringtone's volume to minimum, and convert the email account setting to the home account. Figure 3 shows the email account has been converted to the home account.

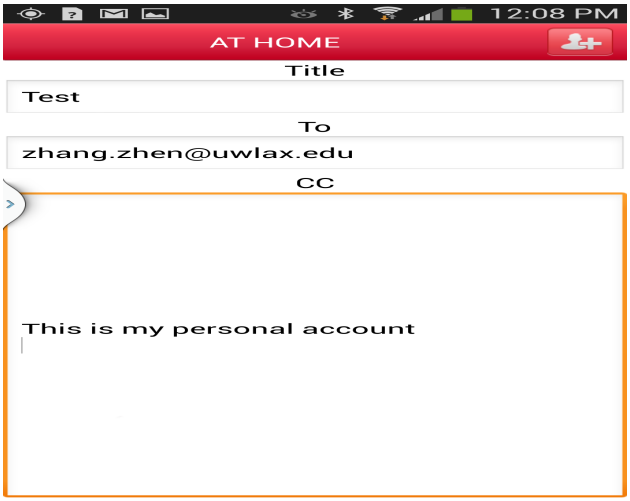

Figure 3 Sending Email from Home

The application will also list the movies showing for the next few hours at nearby cinemas.

5 On the Go

When the user is not at work or home, the application will identify the phone's status to be on the go. It will change the wallpaper to be an on the go background, set the ringtone's volume to maximum. The application will read the user's current location from the built-in GPS, then display a map with a number of points of interests close by. Once the user selects a destination, the routing information from the user's current location, to the destination will be given. Figure 4 shows the map when the user is on the go. The blue dot represents the user's current location, the red balloons are the points of the interest.

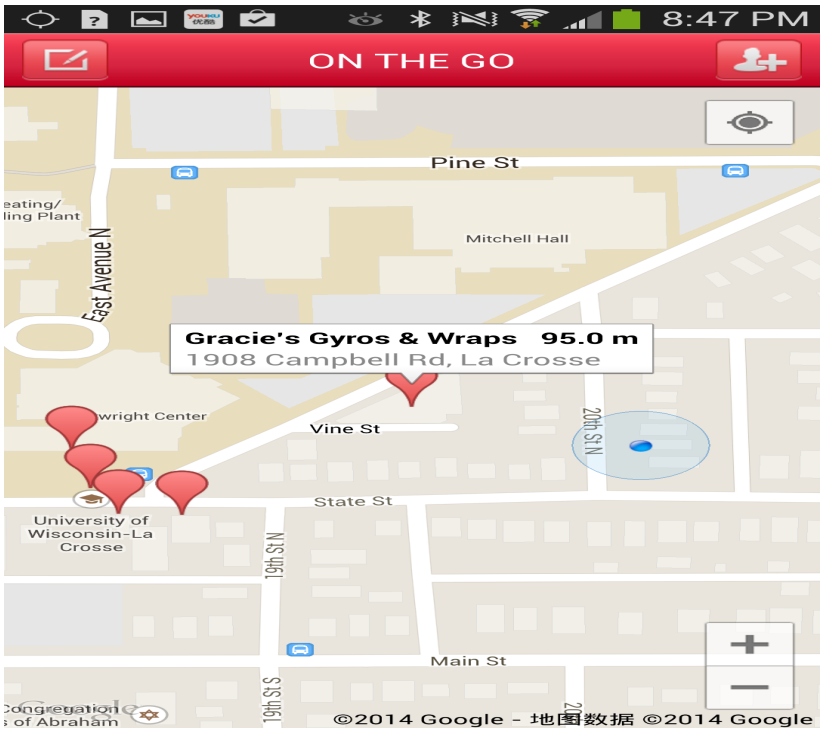

Figure 4 On the Go

6 Conclusions

This project uses MySQL database as a backbone to store the user's profile, keywords in the calendar, restaurants, and movie information. The map and routing functionalities are implemented by using Google Maps Application Programming Interface (API).

The new generation of smart phones has multiple embedded sensors (e.g., accelerometer, gyroscope, light, video, microphone, camera, GPS, digital compass, etc.) and can easily communicate with external sensors via any of the built-in interfaces including Bluetooth, infrared, or WiFi. This project develops an application that is adaptive to the dynamic context. It is aimed to practice how to

read and write some of the built-in sensors. The knowledge gained from this research work will be discussed in how to best utilize these technologies.

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